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ABSTRACT

The myriad and complex health and safety needs of a college or university campus are discussed. Consideration is given to the demands of fire prevention, accident prevention, food service standards, and the mental and physical well-being of students, faculty, and staff. Structural and architectural concerns of the well-designed campus are enumerated, and procedures for ensuring laboratory biosafety and radiological health are examined. Emergency medical and disaster planning measures are also discussed. (LH)

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THE CAMPUS AS A TOTAL COMMUNITY

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TABLE OF CONTENTS

ABSTRACT	1
INTRODUCTION	1
ENVIRONMENTAL HEALTH	4
Food Service	4
Insect and Rodent Control	5
Multi-Use Athletic Facilities	7
Housing	9
Laboratory Animal Facilities	12
Student Activities	13
OCCUPATIONAL AND ENVIRONMENTAL SAFETY	14
LABORATORY BIOSAFETY	16
RADIOLOGICAL HEALTH	18
LIFE SAFETY AND FIRE PREVENTION	21
EMERGENCY MEDICAL AND DISASTER PLANNING	23
POLICIES AND REGULATIONS	25
SUMMARY	26

ABSTRACT

A college or university campus supports a wide variety of activities which may present opportunities for occupational, recreational or incidental hazards.

The legal and moral responsibilities for the physical and mental well being of individuals and the protection of property in an academic setting requires a multifaceted program encompassing environmental health, occupational safety and health, laboratory biosafety, radiological health and life safety and fire prevention. The oversight of such a broad spectrum program must rest with qualified persons with expertise in the special areas. Success of any program is dependent upon the reaction of an informed trained community. The author reviews the program disciplines as they occur on his and other campuses throughout the United States.

INTRODUCTION

A college or university is more than instructors, students and classrooms. A campus is a total community, a place where almost any activity can occur and probably does. Prior to 1939 professors Richard G. Bond and the late Herbert Bosch recognized this complex of activities in an academic setting required expertise in environmental health subjects and initiated both academic and service oriented programs at the University of Minnesota.

The program at the University of Minnesota and other early programs were established on the basis of recognized need. That need has not diminished; in fact, the need for supervision of campus occupations and research has increased along with increased awareness of chemical hazards, more sophisticated research, and a personal sensitivity to conditions of

life. Today the presence of qualified occupational and public health oriented environmentalists is essential in academia.

Campus based Environmental Health and Safety programs usually encompass the broad spectrum of disciplines found in several governmental public health, safety and labor oriented agencies. Activities supervised include food preparation and service, swimming pools, housing, waste disposal, meat processing, milk pasteurization, cheese making, deep sea diving, water supply, insect and rodent control, air pollution control, radiation safety, and range to the more exotic areas of laboratory safety which include control of experiments involving carcinogenic chemicals and recombinant DNA molecules. The program scope may also include occupational health and safety, fire prevention and safety, traffic safety and special areas such as services for the handicapped. It is not unheard of for such a program to even include campus canine control.

If all of this seems incredibly far ranging, a look at the composition of a campus is in order. While there is no such thing as a typical campus, a few general facts about campuses may assist in providing a composite "picture" of what one would find. Let the following represent a campus, parts of which alumni may recognize as "their" campus. Visualize three main campus sites totaling 1500 acres, 16 satellite locations, 200 buildings providing nearly 7,000,000 square feet of space, 600 research laboratories, affiliation with 7 hospitals for the medical sciences, 9 ten story residence halls (and some "little" dorms from four to seven stories), 5,000 students in residence, miles of roadways, 10,000 parking spaces, 25,000 day students, 8,000 employees, a menagerie of laboratory animals, venomous snakes and insects, some of the largest cockroaches (experimental) one could bear viewing and buses carrying 300,000 student passengers each month.

The description above actually applies to a school which has its major orientation toward medical sciences, engineering and chemistry. Although classified as a large school, it does not have an agricultural major with all the academic and practical interests of food production and processing or animal husbandry, neither is there any representation for forestry, marine science or aeronautical engineering. It does have, as a point of continuing interest, a nuclear reactor that has not escaped activists attention and which functions solely as a research facility.

Some universities have strong schools of agronomy and because of this also have associated schools of veterinary medicine. Coastal schools such as those in Washington, Florida or New York have wide-ranging marine occupational and biological science departments. As one might suspect, regional needs often dictate the variety and emphasis schools place on academic programs which, in turn, affect the scope and emphasis of Environmental Health and Safety programs. Thus, in a university setting as in a municipality, consideration is given to "total community".

The wide variety of problem areas is the catalyst for the Environmental Health and Safety programs additionally characterized by diversity of function. A broad spectrum program may have at least five major divisions, each functioning for the benefit of faculty, staff, students and surrounding community. Recognizable titles are: Occupational and Environmental Safety, Laboratory Biosafety, Environmental Health, Fire Prevention, Life Safety, Personal Injury Investigation and Radiation Protection.

ENVIRONMENTAL HEALTH

An academic setting with 25,000 day students can easily have 30,000 persons on campus during peak hours of a normal day. The usual demands are present for food service, housing, assembly, utilities, transportation, waste disposal, recreation, comfortable working space and control of insect and rodent pests. Colleges and universities having some degree of environmental health or safety program vary in student population from several hundred to more than 50,000. There are approximately 50 campuses of 15,000 students or more which have Environmental Health and Safety programs.

Food Service

A "campus city" may have fifteen to twenty preparation and service areas including a few specialty shops for pizza, subs, a deli, a bar/disco, on-premise consumption or, " . . . delivered to your room hot" service. Satellite service is a practical method of resolving the task for serving 150,000 meals per week to persons housed or working in a number of locations which may be miles apart. This type of operation requires a commissary where all major receipts, storage and processing occurs. With controlled receiving and preparation it is possible to monitor products from receipt through storage, preparation, intra and inter-campus transportation and service.

Public health concerns for food preparation and service are the same as in any municipality. Control is in accordance with local ordinances, State law or the Food and Drug Administration recommendations[1] when they are more strict than State laws.

Management of the food service varies. Some institutions may have contract caterers, others may hire their own directors and staff and assume all responsibility. As an in-house service it is possible to control product by contract. Awards are made, not only on price but, on the ability of the purveyor to meet document criteria. This affords an opportunity to maintain close inspection of the product from processing to receipt at the institution and permits control over the least number of producers for the greatest amount of product.

Food service employee training programs can be more successfully carried out than in municipalities. Most employees are longterm, the opportunity to require attendance is available, personal relationships develop and loyalties to the location are formed as years of service accrue. Conducting training courses for a staff of 500 is challenging and rewarding. Not only is it possible to encourage proper food handling techniques, but there is ample opportunity to stress factors which instill safe working habits. This broadens service to the employee as it is possible to demonstrate benefits to health and job satisfaction by reduction of physical discomfort, lost time and fatigue as a result of improved working habits and conditions.

Insect and Rodent Control

A university community is not immune to infestation by the usual pests such as roaches, silverfish and rats. Roaches are especially hard to control because of the large number of animal facilities, underground tunnels and infrequently visited storage spaces. There are also thousands of dormitory residents, many of whom are not yet experienced housekeepers. Delayed reports of infestation also compound the control

problem.

The pride and capabilities of groundsmen to landscape and nurture plants and shrubs can create situations which make rodent control difficult.(2) Campus buildings are enhanced by plantings of shrubs and dense ground cover which afford protected burrows and runways. An urban university reports after years of being practically rodent free it was literally invaded when the local county health department abandoned its rodent control programs. In order to combat the problem, groundsmen were immediately trained to recognize infested areas and to place poison baits safely and effectively. The success of the campus program encountered frustration because of the continual influx of rodents from the surrounding community. With the reintroduction of the community program and limited campus control, rodents no longer were observed during daylight hours, if at all. There was an advantage to the "invasion". For purposes of both rodent and insect control, refrigerated, rodent-proof holding rooms were constructed for kitchen wastes and dumpsters, inaccessible to rats, were placed to receive all other wastes.

A very real problem in insect control in research-oriented buildings is the possibility of changing the cholinesterase levels of experimental animals. This is especially true when blood levels must remain controlled during immunological or genetic tests. The probability of offspring mutation is also important and the environmentalist must exercise close supervision of pest control operations to make sure that neither air space, laboratory utensils, cages or feeds are contaminated.

Commercial pest control operators under contract should be supervised by the environmentalist. As critical control problems arise,

departments of Environmental Health and Safety often find it appropriate not only to supervise but to engage in identification of the pest, estimation of the scope of infestation, the selection of insecticides and frequently to become directly involved in applications.

While environmentalists at northern schools anguish over a few cockroaches, those at southern schools such as the University of Tennessee at Knoxville battle with wood destroying insects such as termites. This school has three technicians and a sanitarian involved in pest control. Departmental control and direct service is a prime option. Improved service can be additionally obtained by training persons within departments; i.e., food service, animals units or groundsmen to assess problems and to augment control activities.

An environmentalist directly engaged in supervision, training and application of "restricted use" pesticides must comply with U. S. Environmental Protection Agency regulations[3] governing training and licensing. The Federal Insecticide, Fungicide and Rodenticide Act classifies pest control activities for colleges and universities as "Commercial-Industrial, Institutional, Structural and Health Related Pest Control." Individual states are charged with conducting training programs and issuing permits.

Multi-Use Athletic Facilities

Municipalities provide recreational facilities for citizens by various means through parks and recreation departments. The usual activities are tennis, golf, swimming, ice skating and open fields for hard and soft ball games, touch football, basketball, soccer, volley ball and the inevitable family outing - picnicking. In addition, private enterprise

is busy establishing means for bowling, racquet clubs, squash courts and roller skating. With the exception of roller skating, major universities provide all these and more. Some, in addition to those listed above and varsity teams of all types, may include fencing, archery, gymnastics, weight machines and indoor running tracks large enough to permit a state meet or a field house with a dozen or more basketball courts.

Each facility supporting a program is primarily intended as an integral part of an academic program. Compounding the demand for facility use are the many students seeking intramural and recreational opportunities. Stress on the physical plant is also extended by athletically inclined faculty and staff. Weekends are often times when facilities are made available for family recreational periods. The gym/fieldhouse of one school is open daily from 8:00 A.M. to midnight, and, it is not enough. To ease the load an air-support structure is also open until the wee hours of the morning. A second air-support structure is on the drawing board. Each building will be 260 feet long and 120 feet wide. It isn't unusual to conduct a high school track meet at the existing structure until midnight and then have residence hall students entering to participate in an inter-residence competition. As many as 15,500 persons use these facilities daily.

A California school, Long Beach City College, extends its swimming pool to the municipality at-large for recreation, competitive sports and for classes in water safety, skin diving and water ballet. Users of this fine facility include such groups as an Amateur Athletic Union sanctioned swim team, a National Youth Sports Program, summer day camps and a physical education department sensory motor development stimulation

program. The handicapped are made welcome by providing ramps, wheelchair lifts and other structural modifications.

With large numbers of participants coursing through a building making personal contact with surfaces and equipment, the maintenance and disease preventive measures are under tremendous pressure. The personnel of Environmental Health and Safety must be continually alert not only to monitor the activities, but to be acutely aware of the variety of diseases which can be communicated by body to body contact, contact with fomites or transmitted because of inadequate sanitation practices.

Housing

The potential for student accommodations varies widely depending on the basic policy of the school. Administrative policy may create a commuter campus with no facility for student residence or a combination of commuter-residence with housing as at the University of Massachusetts at Amherst for as many as 12,000. Larger universities which have strong graduate programs or long-term professional programs with married students also have apartments for couples.

The Environmental Health and Safety staff is involved in many ways, i.e., review of plans for construction or alteration, fire alarm systems, smoke and heat detection, fire suppression, installation of kitchens and kitchenettes, emergency evacuation procedures and training of cadres with special attention to the handicapped, promulgation of rules for electrical appliances and use of combustible materials in rooms and inspection of rooms to assure maintenance of appropriate health and safety standards.

Problems created by students, especially freshmen and sophomores, flexing their new-found freedom from parental supervision can be predicted. False fire alarms are frequent at the early part of fall semester and taper off toward the end of the year. Many occur in the early morning hours when celebrants feel the rest of the residents should have an opportunity to share that "special" occasion. Although it is intended as a prank, there may be very serious consequences. The frequent false alarm causes refusal to evacuate " . . . unless there is real need". Experience with the development and progress of fires has shown that when the need is obvious it may well be too late to evacuate.

Cooking in sleeping rooms is not permitted. Still, the temptation to be comfortably self sufficient is too great to resist. Cheap electrical appliances surrounded by combustibles are often the cause of fires.[4] This is especially true when the room occupant starts a meal and decides to make a "quick" visit to a nearby friend. The forgotten pan cooks dry or the grease overheats and bursts into flame. The ultimate in water fights is attained by using pressurized, two and one half gallon capacity water fire extinguishers. An expensive pastime when one considers as many as one hundred a month may have to be refilled. Desperate safety officials have threatened to add washable dyes to the extinguishers in order to identify the participants. There is no evidence this threat has been actually put into practice. Fluorescent dye in vaseline has been used on pull stations in order to detect those responsible for false alarms. Success is dependent upon the culprit staying in the building. In a complex of thirty-eight buildings it is im-

possible to track a person to a specific room once that person leaves the area of involvement.

Environmental Health and Safety personnel depend on housing staff for assistance in carrying out the many disciplines. At the University of Massachusetts at Amherst, there are 352 staff and upper level students who serve each floor as counselors and evacuation monitors. Student first aid and fire teams also assist at each drill or alarm.

In the ten years from 1969, a year of riots, to 1979, the attitude of students has changed immensely. The pendulum has swung from group identity to one of establishing a personal image. The return to self assertion is not without its difficulties for the environmentalist. One must remain very flexible to deal with exotic pets such as tarantulas and boa constrictors, with birds and gerbils and with a multitude of alterations to rooms designed to encourage drop-ins. Many of the changes are affected by using combustible materials. Wall hangings, ceiling drops, door drapes and ceiling to floor panels which create a privacy area contribute considerably to the fire load and grey hairs while trying to get them removed or fire retarded.

The desire to create and to attract attention extends to sound equipment with excess decibel levels, strobe lights and candles for atmosphere. Floor parties provide escape from boredom and regimentation. Seasons of the year provide opportunities for expression of talents and personality. Room interiors, doors and hallway walls become natural places for copious materials. The control of Christmas decorations in hallways and lobbies is an especially sensitive area but essen-

tial as many know who follow fire reports [5] and note serious fires and the fatalities which occur.

Laboratory Animal Facilities

An institution deeply involved in research activities relating to the health and life functions of humans must rely heavily upon animals for determining the efficacy of medicines, immunological sera, carcinogenicity of substances or surgical techniques. The State University of New York at Buffalo animal unit stocks forty-three different species of animals including ordinary pound canines, specially bred colonies of mice and large, vigorous primates. The staff of this unit, having hundreds of animals used in more than one hundred forty different experiments, includes graduates in veterinary medicine, veterinary technicians with expertise in pathology, histology and microbiology to serve as directors of laboratory animal units and as advisors to principal investigators. The animal unit technical staff and supporting committees promulgate the policies for control of zoonosis, animal quarantine, animal health and conditions of use and care.

Space requirements for animal units include animals rooms, feed storage, cage and equipment washing rooms, waste incinerators, environmental chambers, medical treatment and surgical areas. The environmentalist has considerable responsibility in advising animal handlers in measures of housekeeping, disinfection of surfaces and equipment, ventilation and air exhausting, transportation and handling of wastes and insect and rodent control. Among the more important actions will be to discern and monitor laboratory biological containment levels.

In the broad spectrum Environmental Health and Safety program,

it may be necessary to deal with workers compensation claims for animal bites, allergies to surfactants or animal dander, claims for work acquired histoplasmosis or zoonosis such as green monkey disease or Q fever. There are also instances when the environmentalist must assure that experimental areas are free of communicable diseases to protect tradesmen and to monitor the use of personal protective devices when equipment repair is called for.

The environmentalist is guided in the care and use of animals for experimental purposes by accreditation standards and State laws which deal with the many facets of animal handling.(6)

Student Activities

Environmental Health takes on a new meaning on campus through advice and supervision of student activities. The enthusiasm, imagination and energy of young adults in well known. These characteristics culminate in esprit de corps, loyalty for school and friends, maturation of the individual and limitless ideas for self expression and generation of yet more group participation. As years progress it's enlightening to note how this age group keeps "originating" the same stunts with the same enthusiasm to succeed. Over a period of ten years student attitudes have changed from a desire to "trash"a building to constructing a fourteen foot high by eighteen foot long replica of the opposition school's Great Dane mascot as fodder for the homecoming bonfire. There is a "special breed" who are athletically and theatrically endowed and would gladly skydive onto campus or drive pitons into the exterior of a high rise and proceed to "the summit". Permission denied.

In-house discotheques are a weekend regular event. Perpetuating

the desire to be as equal with contemporaries as possible most campuses have on-site bars as an integral part of the disco, along with pizza, subs, onion rings and fries.

Foreign students are often eager to have the general public become aware of their customs. One group greets their new year with a magnificent stage production complete with elaborate costumes and dinner for eight hundred as an annual event.

Environmental Health and Safety interjection is at the point of planning. (No event should occur without expressed sign-off of involved departments, including student organizations.) Typical consultation involves consideration of possible limits on numbers of participants, construction details, sound levels, food sanitation, permit from local and State agencies (fire departments, environmental conservation, health departments, etc.), fire prevention and life safety and the inevitable clean up chores. It is important to maintain the attitude of guidance as opposed to dictation. Initial proposals for events are often all encompassing and impractical. As planning for the event progresses, students readily discern the limits of their abilities, the desire of others to cooperate and finally the limits of financial support.

OCCUPATIONAL AND ENVIRONMENTAL SAFETY

The work place has always contained varying degrees of hazards. Some hazards result in temporary personal injury, permanent disability and even fatal injury. The promulgation of strong federal worker safety and health laws in 1970[7] forced non-public institutions to initiate or strengthen protective activities which would ensure a safe place to work. Many public

educational institutions, while not legally required to enforce the federal statutes, recognized the moral responsibility for personnel and adopted the U. S. Department of Labor occupational safety and health standards as policy. A ready awareness of civil liability may also have provided impetus to adoption and institution of effective programs.

There are many means by which individuals may become injured on a college or university campus. Some injuries may be rather exotic and others mundane. Certain experiments with humans may involve a centrifuge traveling at 400 miles per hour or physical limit stresses in chambers simulating arctic or tropical conditions. Skilled tradesmen as well as certain students and faculty members are exposed to the hazards of working with nearly every kind of wood and metal-working machine available. Athletes and persons involved in intramural sports suffer bruises, scrapes, dislocations and an occasional fracture. The most common cause and perhaps the most mundane injury is a fall on the same level such as a floor or sidewalk.(8) Some accidents can be humorous when results are merely messy, not serious. An unopened can of ravioli left unattended in an autoclave can expend a great amount of explosive energy, and it's messy.

Many faculty, students, tradesmen and custodial staff are exposed to biological and chemical hazards and sometimes to equipment at great pressure extremes as they experiment, repair, build or clean. The very fact that "experiment" means to deal with the unknown conveys the need for the environmentalist to be alert, to question and not to be too surprised when requested to dispose of the results of a chemical experiment which "may explode" if moved. It is not surprising either that tradesmen refuse to enter an environmental chamber labeled "Caution, Syphilis

Experiment" even though only chickens are involved.

Both the service (consultation, advisement, interpretation of laws, training) and enforcement (inspections, reports) functions must be modeled in ways which ensure physical as well as mental well-being. The model program in occupational health or for environmental health places prevention as a priority rather than reaction. Protection of the total community is affected by identification and elimination of hazards, educational programs to develop awareness of safe procedures and, as may fit the occasion, substitution for materials, reagents or processes which may be hazardous.

LABORATORY BIOSAFETY

The function of a university is to dispense knowledge, to question and to develop answers to as many questions as possible. In these pursuits investigators utilize all manner of pathogenic organisms, toxic and corrosive chemicals, derivatives of cells which have the ability to reproduce selected characteristics, animals, insects, species of plants and vectors and hosts which can be beneficial or produce deleterious effects.

It is vital to both the university and the community that these experiments be monitored to prevent escape of hazardous agents and materials from the laboratory, that procedures be reviewed, equipment tested critically and selectively and that laboratory technicians be carefully trained. (Training must include the hazards of the subject of research as well as safety fundamentals.) To insure control, research funding organizations often require adherence to specific guidelines and authorize release of funds only after certifications for containment and processes are received from campus authorities.

To meet the mandatory guidelines,[9] Biosafety committees consisting of persons technically and professionally qualified review projects for research and teaching and issue certifications of compliance and determine university policy. An on-site survey, inspection, testing of equipment and training of personnel are delegated to the institutional environmentalist.

Protection of technicians, as well as the public, often depends on the use of special, aerosol-confining equipment such as fume hoods, glove boxes or safety cabinets with high efficiency filters to trap errant organisms. The institutional environmentalist (Biosafety Officer) performs tests which assure there are no leaks in the cabinets or filters and that adequate volumes of air transport and confine organisms or dilute and exhaust noxious fumes. When it becomes necessary to change filters or make repairs, environmental health personnel assume responsibility for decontamination and recertification.

When radiation protection programs are not in Environmental Health and Safety offices, liaison with the health physicist responsible for radioactive isotopes is necessary as many investigators use radioactive materials as tracing elements. The environmentalist must consider dual contamination by biological organism and radioactive isotope as a possibility when working on laboratory equipment or clearing a project for work to be performed by tradesmen.

Individual laboratory design and construction requirements fluctuate from month to month or year to year as the experiments or investigators change and as the equipment needs vary. Coordinating space alterations and rehabilitation with the offices responsible for planning, construction and purchasing is an important task of the Biosafety Officer

as each office often perceives its functions separately from the whole of the project. Without knowledgeable guidance proper containment may not be provided or worse, health hazards may actually be built into the facility.

RADIOLOGICAL HEALTH

Contrary to the concepts and denouncements of some concerning radiation hazards, the use of radioactive isotopes has become a very definite way of life for many persons, faculty investigators and student assistants involved in biological research, chemistry and medical diagnosis. The isotopes used range from very short lived, low energy elements in small amounts to very long lived, high energy elements in large amounts. In addition to isotopes, some campuses house nuclear reactors or ultra-high energy producing equipment such as cyclotrons and linear accelerators where high energy radiation is deliberately produced or may be a by-product of operation. X-ray producing equipment may be present in the form of electron microscopes, diffraction units to study crystalline structure, units for studying human physical or dental conformation or treating pathological conditions.

Institutional users are departments of physics, biology, pharmacy, geology and chemistry and schools of engineering, dentistry and medicine. The research laboratory probably incorporates the major population of persons utilizing isotopes. Those who use these materials may learn about sources and techniques as lab assistants or in more formal academic settings. In-service training may also be required for each user before a use-permit is granted. Undergraduate and graduate courses include such

subjects as radiation protection, nuclear engineering, environmental radiation monitoring, isotope tracer techniques, reactor safety and radiation effects. These are only samples of courses but it does convey an idea of concern for the future and the qualifications of those who either use or monitor the use of isotopes and energy producing equipment.

With both ionizing and non-ionizing radiation sources in hundreds of locations there is the potential for exposure of hundreds of on-premise persons, directly or indirectly. There is also a possibility many more off-campus persons could be exposed to improperly disposed radioactive wastes. For these reasons a qualified team of health physicists is required.

An eastern campus lists personnel likely to be exposed to radiation as those involved in the production of radioisotopes, employees of a reactor center, those who work with radioactive materials and those who work with radiation producing devices.

Under Federal[10] and State mandates the responsibilities and authority of radiation protection officers are very comprehensive. Millions of dollars in research programs (for one institute) may rest in the balance of a well monitored or carelessly controlled protection program. At Massachusetts Institute of Technology the responsibilities of the Radiation Protection Office include:

1) Review of authorization applications,
2) registration and instruction of radiation workers,
3) monitoring of shipments of radioactive material,
4) radioisotope laboratory inspections and surveys,
5) disposal of radioactive waste,
6) personnel monitoring of radiation exposure,

7) area and environmental monitoring,

8) leak testing of sealed radioactive sources,

9) calibration and repair of radiation protection instruments,

10) supervision of radiation emergencies and special decontamination operations,

11) surveys of x-ray machines and particle accelerators,

12) surveys of non-ionizing radiation sources,

13) maintenance of radiation protection records.

This is a typical inventory of a broad spectrum program. A variation to item one above is for the radiation protection officer to be the sole licensee who orders, receives and dispenses all isotopes and recovers all isotope wastes.

A survey of several schools indicates that in each case the Radiation Protection Officer is charged with collecting and disposing of radioactive wastes. Schools, industry and governments, in the United States as well as other nations, are concerned about where such wastes shall be placed for management and at what cost. One solution to the ever-increasing cost has been to compact all solid waste. Airborne radioactive particles become distinctly possible with the pressures of compaction. Temple University reported the installation of a commercial system especially designed to contain radioactive particulates. This system has been utilized or copied by others. The system is surrounded by exhaust air which is drawn through high efficiency filters to collect any fugitive particles. The State University of New York at Buffalo uses a similar exhaust system when transferring solvents from laboratory con-

tainers to drums of vermiculite.

The quality and effectiveness of a radiation protection program, the training of users and care in use of radioactive materials is measurable by the results found on film badges, dosimeters, bioassay results and inspection assays of laboratory surfaces.

LIFE SAFETY AND FIRE PREVENTION

Although a limited number of colleges and universities have broad spectrum Environmental Health and Safety programs, the vast majority of schools have safety programs which are concerned with the planning of buildings to permit persons to escape in emergencies, to provide maximum personal protection and to minimize losses if fires or explosions should occur. The responsibilities in these areas are vested in qualified persons designated safety engineer, fire marshal, fire safety technician or perhaps safety officer. The departments carrying out the programs may be distinct of themselves or may function within departments such as facilities planning, physical plant, campus security or public safety.

Persons and agencies involved in promoting and protecting life and property are numerous. National organizations such as the National Fire Protection Association, Underwriters Laboratory Inc., Faculty Mutual systems, commercial laboratories, many universities and at least eight federal governmental departments with approximately thirty agencies sponsor or conduct research on combustibility of materials, methods of construction, systems of storage and transportation of flammables and means of fire and smoke detection and suppression. Much of the results of research, as well as individual experience, is made avail-

able in concensus standards such as the fire safety standards of the National Fire Protection Association (NFPA) and the various building construction codes recommended by national insurance or construction associations. Of all the tools which can be used in safety programs, the NFPA standards are perhaps the most popular as they can be adopted by an academic institution in total (sixteen volumes),[11] adopted in part as the Life Safety Code or used to supplement an existing Building Construction Code which often is nearly identical. In the case of universities and colleges which are private institutions subject to the U. S. Department of Labor Occupational Safety and Health Act, the NFPA standards have been incorporated as legal requirements and apply to these institutions.

The goal of this portion of a safety program is predicated upon " . . . the need to counter the effect of fire upon the occupants of a structure, the need for occupants to find safety, and the need to provide the structural elements that will ensure a route to safety."[12] To this end materials for buildings are selected which provide fire resistance of tested lengths of time according to area of use, i.e., stairways, passageways, interior trim, etc. Planned routes of unobstructed travel and compartmentalizing of spaces by means of smoke and fire barriers augment construction materials to maximize safety. Additional factors for personal safety include the installation of smoke and fire detection systems, sprinklers, hose cabinets and fire extinguishers.

The training of occupants is an important adjunct to maintaining safe physical facilities. It is rather standard procedure to develop building evacuation procedures which involve personnel as building wardens, floor evacuation monitors for fire drills and evacuation and fire control

and first aid wardens for other emergencies. By combining administrative services and personnel involvement, the greatest degree of life safety is obtained.

EMERGENCY MEDICAL AND DISASTER PLANNING

Thousands of people cannot occupy millions of square feet of building space and be exposed to innumerable hazards without inherent concern for their personal safety or wonder who will react if there is an emergency involving the physical plant, themselves or for that matter, a contemporary. Persons who are actively engaged in the day-to-day affairs of keeping the institution running are well aware of the many persons who can react to emergencies. Contrasting these are many who have limited contact, even within their departments and when given the opportunity express great insecurity about their well being. They are even cynical about who might care.

The institutional environmentalist with a ready acquaintance of the multiplicity of activities, persons and facilities is in a good position to be a leader in and coordinator of emergency planning. The essential purposes of an institutional disaster plan are to construct a chain of command which will insure access to and control by the chief administrative officer and to involve as many individuals as possible in each building so that everyone knows that, when needed, help is available, that someone cares and knows, and they are not alone.

Disaster plans take many forms; from the voluminous detailed manual to a basic format to be implemented by each building leader. The basic plan should include listing of external resources, i.e.: fire department and police pre-response plans, and internal status for administrative

officers, department chairmen, building representatives, campus police, physical plant staff, the university health service and, of course, Environmental Health and Safety.

The State University of New York at Buffalo has over four hundred persons involved in a Building Evacuation and Security program. Persons within buildings are trained to monitor evacuation, assist in minor fire control and to provide emergency first aid.

The "master" disaster plan assigns the following responsibilities:

Building Cadre - Evacuation, fire control, first aid, notification of emergency.

University Police - Crowd control, direction for municipal fire and police departments and ambulance service.

University Health Service - Triage, first aid.

Physical Plant - Utilities, heavy equipment, transportation.

Municipal Fire Department - First aid, heavy rescue, fire control.

Municipal Police - Perimeter crowd and traffic control.

Community Hospitals - Pre-selected for facilities, i.e.: emergency rooms, hyperbaric chambers, out-patient departments.

Supplementing faculty and staff are student first aid teams which function routinely in residence halls and which will be available in the future for public events. The directors of Environmental Health and Safety and University Health Service are coordinators for the student teams, set criteria and examine prospective participants.

The Office of Environmental Health and Safety coordinates the emergency program, trains all faculty and staff in first aid, cardio-pulmonary resuscitation and fire control, maintains a mobile emergency disaster unit and provides supplies and equipment for all student oriented and departmental training courses.

POLICIES AND REGULATIONS

Programs encompassing the broad aspects of public health, occupational safety and health and life safety in the public institutions may be exempt from both Federal and State laws. Inasmuch as the program functions without benefit of enforceable laws, warrants, injunctions or judges it is important, for progress and compliance, that administrative policies establish the guidelines of operation and procedure. Institutional policy should set forth the scope of the program, authority of the director, responsibilities of officers and department heads and the obligations of individuals to abide by the policy. It is also incumbent that student regulations outline responsibilities of students to comply with health and safety guidelines. Environmental Health and Safety program directors may be assisted in promulgating policies and developing programs by persons possessing professional and technical interests who serve on the institution-wide advisory committees for Environmental Health and Safety, Biosafety or Institutional Safety.

Without enforceable law it might seem difficult to obtain compliance. This is not the case. The integrity of principal investigators and individuals is such that every effort is made to voluntarily follow rules and regulations which apply to other segments of the community. A primary responsibility of the Environmental Health and Safety service pro-

gram is to promulgate policies and to interpret and disseminate available regulations and to insure understanding of these rules, policies and procedures by conducting effective educational and training programs.

SUMMARY

The college and university community presents an opportunity for the application of the professional skills of environmentalists in a very wide distribution of health and safety disciplines. Initially these programs were instituted voluntarily as a recognition of moral and social responsibility. As the national community has become more demanding legal responsibilities in the form of laws, regulations or official agency guidelines have had a direct effect on administrative need to create protective programs and staff them with appropriately trained persons.

Protection of persons and property includes matters which concern the physical plant, biological function, personal judgment, theoretical concepts and at times a form of "mass hysteria" by those caught up in current health related proclamations of faddists or special interest groups.

The environmentalist on a college or university campus enjoys the privilege of working in surroundings which seemingly have no boundaries for new ideas or opportunities to exercise the mental gymnastics necessary to test them.

APPENDIX

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